

## REMARKS

Claims 1-17 were submitted for examination, and all claims have been rejected. Applicants are hereby amending claims 1-4, 6, 7, and 12-15 and adding new claims 18-20. Applicants are also amending the specification and figures to correct minor errors. A copy of a letter to the chief draftsman indicating the proposed figure changes is submitted with this amendment. Reconsideration of the above-referenced patent application as amended is respectfully requested.

Applicants have amended claims 1-4, 6, 7, and 12-15 to correct minor errors and to more clearly define the scope of their invention. Claim 1 as amended defines a method for implementing bump mapping. The claim recites, in part, "estimating angle coordinates for a pixel in a polygon" and "modifying the estimated angle coordinates, using a perturbation source".

An embodiment of the invention as defined, for example, in amended claim 12 is a machine-readable medium that stores instructions to implement a method for assigning a color value to a pixel. The claim recites in part "estimating first and second angle coordinates for the pixel" and "perturbing the first and second angle coordinates to provide modified first and second angle coordinates". Claims 7 and 15 define graphics systems for implementing bump mapping using methods similar to those defined in claims 1 and 12.

Claims 1-17 have been rejected under 35 U.S.C. §103 as being unpatentable over U.S. Patent No. 5,949,424 of Cabral et al. ("Cabral") in view of 3D Studio MAX ("Studio MAX"). Applicants respectfully traverse this rejection.

Cabral discloses a mechanism that implements bump mapping using a tangent space transform matrix (abstract, col. 2, lines 52-60). A tangent space transformation module transforms a lighting vector and a viewing vector into a tangent space and a bump mapping

module interpolates and normalizes the tangent space lighting and viewing vectors. The bump mapping module performs a vector operation, e.g. a dot product, on the tangent space lighting vector and the perturbed normal vector for each pixel (col. 4, lines 1-22). The perturbed normal vector is provided by a perturbed normal texture map (col 3, lines 24-29).

Cabral thus fails to disclose the use of angle coordinates to capture per pixel orientation information, as in applicants' claimed invention. For example, Cabral fails to disclose estimating angle coordinates for a pixel or modifying the estimated angle coordinates using a perturbation source, as recited in Applicants' claim 1. Similar limitations are recited in Applicants independent claims 7, 12, and 15.

Nor does Cabral suggest these claimed features of Applicants' invention. Cabral teaches the interpolation and normalization of vectors (col. 4, lines 15-17). The reference to a "half angle" in this passage is a misprint that should read "half angle vector", a term that appears in full throughout the specification. Applicants claimed invention uses angular coordinates to avoid the computational costs associated with normalizing interpolated vectors by using angular coordinates.

The Examiner acknowledges that Cabral fails to disclose either a table of color values or assigning these color values to pixels according to one or more color variables. The Examiner cites Studio MAX for its disclosure of a UV map.

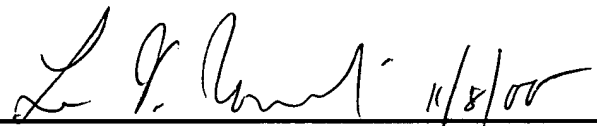
Applicants note that Studio MAX does not teach the use of angle coordinates in bump mapping nor does the Examiner suggest that it does. Regardless of what Studio Max may disclose about color tables, it fails to remedy the above-noted deficiencies of Cabral.

In view of the foregoing, Applicants submit that independent claims 1, 7, 12 and 15 are patentably distinguished over any combination of Cabral and Studio Max. Claims 2-6, 7-11, 13-

14, and 16-17 depend from independent claims 1, 7, 12 and 15, respectively, and are patentably distinguished over Cabral and Studio Max for at least the foregoing reasons.

In view of the foregoing remarks, Applicants respectfully submit that the rejections of the claims submitted for examination have been overcome, and that the now pending claims are in condition for allowance. If the examiner disagrees or believes that further discussion will expedite prosecution of this case, he is invited to telephone applicant's representative at the number indicated below.

Yours truly,

 11/8/00

Leo V. Novakoski, Reg. No. 37,198  
Intel Corporation  
SC4-202  
Mission College Blvd.  
Santa Clara, CA 95052-8119  
408-765-5334

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